

REMARKS

Upon entry of the present Amendment-E the claims in the application are claims 16-37, of which claims 16, 22, 28 and 37 are independent. New claim 37 is added herein.

The applicant gratefully acknowledges indication by the Examiner that claims 17-21, 23-27 and 29-33 contain allowable subject matter although the claims are objected to as being dependent upon a rejected base claim.

Applicant respectfully submits that the above amendments are fully supported throughout the original disclosure. Applicant also respectfully submits that no new matter is introduced into the application by the above amendments.

After careful consideration of the objections and rejections set forth in the Office Action, applicant respectfully submits that as listed herein, all pending claims patentably distinguish over the art of record, and requests allowance of all pending claims, as discussed further below.

Claim Rejections – 35 USC 112

The Examiner has rejected claims 34-36 under 35 USC 112 as failing to have sufficient antecedent basis for the limitation “from the two brightness images obtained with the cameras” in claim 16. It is the Examiner’s position that claims 16 and 34-36 do not teach the use of the cameras to obtain brightness images. The correlation between the cameras and the existing apparatus must be defined.

Applicant’s Response

Applicant has carefully considered the Examiner’s rejection and respectfully submits that based on the above amendments to claims 34-36, the Examiner’s rejection has been over come, since claims 34-36 clearly now have sufficient antecedent basis for the limitation in the claims. Thus, applicant respectfully requests reconsideration and withdrawal of the rejection under 35

USC 112.

Claim Rejections – 35 USC 102

The Examiner has rejected claims 16, 22, and 28 under 25 USC 102(b) as being anticipated by US Patent 5,525,882 to Asaka Et al. It is the Examiner's position that Asaka teaches a position detection apparatus for detecting a position of a moving robot, the apparatus comprising a local image acquisition device 12R for acquiring an image of a forward view of the robot, a distance image acquisition device 12L having the same view as the local image acquisition device, the devices 12R, 12L acquiring images simultaneously. The Examiner states that the apparatus further comprises a characteristic point extraction device that extracts characteristic points from the images by a specific method (col. 6, line 55 – col. 7, line 12, Fig. 4A-C), and a reference characteristic point selection device that selects reference characteristic point for calculating the position of the robot based on the characteristic points and the distance image (col. 4, line 53-col. 5, line 7).

Further, the Examiner states in his response to arguments states that in regards to the arguments related to claims 16, 22 and 28, the applicant specifically argues "Asaka does not teach the use of stereo cameras 12L, 12R to determine robot position. Rather, Asaka uses a distance meter 20 and direction meter 22 (col. 5, lines 16-19) to determine robot position, and Asaka uses the cameras 12L, 12R along with the sonar sensor 14 to identify object surfaces, and avoid the corresponding object in its path." The distance meter 20 and the direction meter 22 are vaguely described by Asaka to assist the run controller 42 in controlling the mobile robot 10 (Col 5 Lines 16-30). It is viewed by the Examiner that these sensors simply provided the distance traveled and the current direction of the mobile robot, the run controller further uses the environment map device (38) to provide an indication of the surroundings of the mobile robot. This indication is a two-dimensional plan view map of the environment (Col 5 lines 22-24). This

environment map device (38) is controlled by the determination of objects by the cameras (Col 5 lines 8-15 and lines 20-24). By the cameras providing an indication of the location of the objects the cameras are essentially providing a relative position of the robot to the objects. The claim requires only a calculation of the position of the moving robot which the cameras provided by the use of the hypothesis 34) (Col 8 lines 27-33).

Still further, the Examiner states in response to the argument presented that Asaka does not teach the use of characteristic points, that Asaka teaches the use of the cameras to determine where brightness abruptly changes and defines a line segment for the abrupt change. This line segment is the characteristic point where the brightness abruptly changes. These characteristic points are then used to determine the position of the object.

Applicant's Response

Applicant has carefully considered the Examiner's rejection and respectfully disagrees with the rejection put forth by the Examiner . Upon review of Asaka, the applicant finds that, along with those arguments presented in Applicant's Amendment D, the disclosure of Asaka is clearly distinct from that of the claimed invention since the line segments of Asaka are acquired for use in reconstituting the surface in front of the mobile robot. Still further, Asaka states that the three-dimensional line segment obtained can be interpreted two ways, that a surface including this three-dimensional line segment is present or that the line segment is simply drawn on the floor. (Col. 6, line 37 – Col. 7 line 12). This is clearly different from the claimed invention wherein the characteristic points are created using two consecutively incorporated brightness images. (Page 15, paragraph [054]).

In addition, Asaka does not disclose use of characteristic points to calculate the position of the moving robot, as claimed, since Asaka does not calculate the position of the robot from this extracted information, but instead uses the sensor information to determine the presence of

an object near the robot. In particular, Asaka discloses determination of robot position using a distance meter 20 and direction meter 22 (col. 3, lines 52-54 and col. 5, lines 16-18). Asaka also discloses (col. 13, lines 5-7) that the sonar ring device 14 and stereo cameras 12 can be used to determine distance and direction. This data is used to determine distance and direction of the object relative to the robot since the application is directed to locating the object and avoiding it. Thus, Asaka does not disclose calculation of the position of the robot based on characteristic points and the distance image, as claimed.

However, in an effort to expedite prosecution of the present application, applicant has amended independent claims 16, 22 and 28 to further define that the “characteristic points are created using two consecutively incorporated brightness images.” This is clearly not disclosed by the invention of Asaka. As such, applicant respectfully submits that the Examiner’s rejection has been overcome, and reconsideration and withdrawal of such rejection is respectfully requested.

Claim Rejections – 35 USC 103

Claims 34-36 have been rejected under 35 USC 103(a) as being unpatentable over Asaka as applied to claims 16, 22, and 28 above, and further in view of US Patent 6,148,250 to Saneyoshi et al. It is the Examiner position that as shown above, Asaka teaches the apparatus, method and program of claims 16, 22 and 28. Asaka teaches the use of two cameras (12R and 12L in Fig. 2 to obtain brightness images (Col 4 lines 35-46). The Examiner states that Asaka doesn’t not specifically teach the distance image pixel represent the distance from the camera. However the Examiner states, Saneyoshi teaches a similar means to obtaining the distance from a camera by suing two cameras. Saneyoshi further teaches the pixels for the images obtained by the cameras represent relative brightness (col 3 lines 3-9). Saneyoshi teach the storing of the distance information as a ddistance image. It would have been obvious to one

of ordinary skill in the art at the time of the invention to use the distance image of Saneyoshi with the object detecting means of Asaka in order to accurately detect the distance to the object.

Applicant's Response

Applicant has carefully considered Examiner's rejection and respectfully disagrees for those reasons discussed above with respect to claims 16, 22 and 28 which are not overcome by any additional teachings of Saneyoshi. Specifically, the Examiner argues above that the cameras 12R and 12L can reasonably be interpreted to correspond to the image acquisition device of the claimed invention. However, he now argues that the cameras of Asaka can also be interpreted to correspond to the two cameras. This is clearly incorrect, since the cameras 12R and 12L cannot be interpreted as two separate components of the claimed invention. In the claimed invention, the cameras are separate from and in addition to the image acquisition device.

Still further, with regards to the disclosure of Saneyoshi, though the reference may disclose the use of obtaining the distance from a camera by using two cameras, this clearly does not overcome the differences stated above with respect to the disclosure of Asaka. Further, the proposed modification of Asaka's system in view of select teachings of Saneyoshi is improperly based on a suggestion coming entirely from the Examiner (guided by impermissible hindsight of applicant's disclosure), rather than from any teaching or suggestion which may be fairly gleaned from the references themselves. The altitude detecting apparatus for a flying object (as disclosed by Saneyoshi) clearly would not suggest or make obvious any modification to any object detecting/avoiding device for a robot (as disclosed by Asaka)

Based on the foregoing, applicant believes that the Examiner's rejection under 35 USC 103 has been overcome, and therefore reconsideration and withdrawal of the rejection is respectfully requested.

Allowable Subject Matter

Again applicant gratefully acknowledges that the Examiner has objected to claims 17-21, 23-27, and 29-33 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Other Matters

New claim 37, which is a new independent apparatus claim combining the limitations of independent claim 16 and dependent claim 17, are added to the application, and is clearly supported by the original application, therefore no new matter is added. These features are not suggested or disclosed by Asaka or other prior art references, and thus this claim is in condition for allowance.

Conclusion

In conclusion, the applicant has overcome the Examiner's rejection of claims 16-36 as presented in the Office Action; and moreover, the applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of the present claims is clearly patentably distinct thereover.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

A Petition for one-month Extension of Time under 37 CFR 1.136 (a) is filed concurrently herewith.

If the Examiner is not fully convinced of the patentability of all of the claims now in the application, applicant respectfully requests that the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable consideration is respectfully requested.

Respectfully submitted,



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September 19, 2006

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